

REMARKS

The amendment of claims 21-22 serves to clarify the invention and is not in response to any claim rejection in the office action mailed 09/15/2004.

The Examiner rejected claims 21-23 under 35 U.S.C. §112, first paragraph, as allegedly failing to comply with the written description requirement.

The Examiner rejected claims 1, 2, and 5-8 under 35 U.S.C. §102(b) as allegedly being anticipated by Ito et al. (US 6,274,505).

The Examiner rejected claims 1-16 and 21-23 under 35 U.S.C. §103(a) as allegedly being unpatentable over Futase et al. (JP 11-245143) in view of Ito et al. (US 6,274,505).

The Examiner rejected claims 22 and 23 under 35 U.S.C. §103(a) as allegedly being unpatentable over Futase and Ito as applied to claim 21 above, and further in view of JP 11-6081.

Applicants respectfully traverse the §102 and §103 rejections with the following arguments.

35 U.S.C. §112, First Paragraph

The Examiner rejected claims 21-23 under 35 U.S.C. §112, first paragraph, as allegedly failing to comply with the written description requirement. The Examiner states: "The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. the applicant has not shown where in the specification suggesting the new limitations of claims 21-23."

In response, Applicants respectfully contend that the content of claims 21-23 are disclosed in Paragraph 26 of Applicants' specification which recites: "Etch system 300 further includes a heater 385 for heating the suspension fluid to a temperature above ambient temperature. A temperature sensor 390 is embedded in upper surface 350 of chuck body 305 immediately adjacent to annular opening 365 for measuring the temperature of the suspension fluid near edge 320 of wafer 310. A controller 395 for displaying the temperature reading of temperature sensor 390 is electrically connected to the temperature sensor and optionally electrically connected to heater 385 for controlling the suspension fluid temperature to a pre-determined temperature at the edge of wafer 310." (emphasis added).

Accordingly, Applicants respectfully request that the rejection of claims 21-23 under 35 U.S.C. §112, first paragraph be withdrawn.

35 U.S.C. §102

The Examiner rejected claims 1, 2, and 5-8 under 35 U.S.C. §102(b) as allegedly being anticipated by Ito et al. (US 6,274,505).

Applicants respectfully contend that Ito does not anticipate claim 1, because Ito does not teach each and every feature of claim 1. For example, Ito does not teach the feature: "directing a second fluid against a portion of the lower surface proximate to the edge of the substrate, wherein said second fluid flows adjacent to the edge of the substrate" (emphasis added). In particular, Ito's disclosure does not satisfy the "against" aspect of the preceding feature of claim 1. The word "against" is defined as follows.

"Against" is defined as: "From an opposite direction so as to strike or touch"; "in contact or collision with". Webster's New Collegiate Dictionary, 17 (2d ed. 1958).

"Against" is defined as: "So as to come in forcible contact with"; "In contact with so as to rest or press on". The American Heritage Dictionary, 86 (2d ed. 1985).

"Against" is defined as: "in the direction of and in contact with". Miriam Webster OnLine,
<http://www.miriamwebster.com/cgi-bin/dictionary?book=Dictionary&va=against&x=18&y=17>.

In light of the preceding definitions of "against", Applicants respectfully contend that in Ito, the second fluid cannot be directed against a portion of the lower surface of the substrate 102, because the second fluid is contained within the device 104 shown in FIG. 1 and FIG. 9 of Ito and has no direct physical contact with the substrate. Thus, it is physically impossible for the second fluid to be directed against any portion of the substrate 102.

Moreover, Ito does not disclose anywhere that the second fluid in the device 104 has a velocity component that is perpendicular to the lower surface of the substrate 102. To the contrary, FIG. 2 of Ito shows the second fluid as having a spiral flow in a direction that is parallel to the lower surface of the substrate 102. Since Ito does not teach that the second fluid in the device 104 has a velocity component that is perpendicular to the lower surface of the substrate 102, Applicants again argue that it is physically impossible for the second fluid to be directed against any portion of the substrate 102.

Applicants respectfully request the Examiner to cite a specific quote from Ito that allegedly teaches the "against" aspect of the feature: "directing a second fluid against a portion of the lower surface proximate to the edge of the substrate, wherein said second fluid flows adjacent to the edge of the substrate".

Based on the preceding arguments, Applicants respectfully maintain that Ito does not anticipate claim 1, and that claim 1 is in condition for allowance. Since claims 2 and 5-8 depend from claim 1, Applicants contend that 2 and 5-8 are likewise in condition for allowance.

35 U.S.C. §103(a): Futase in View of Ito

The Examiner rejected claims 1-16 and 21-23 under 35 U.S.C. §103(a) as allegedly being unpatentable over Futase et al. (JP 11-245143) in view of Ito et al. (US 6,274,505).

Applicants respectfully contend that claims 1 and 13 are not unpatentable over Futase in view of Ito, because Futase in view of Ito does not teach or suggest each and every feature of claims 1 and 13. For example, Futase in view of Ito does not teach or suggest the feature: "controlling the temperature of said second fluid in order to affect a processing of an edge region of the upper side of the substrate" (claim 1) and "maintaining the temperature of said suspension fluid at a temperature different from an ambient temperature while delivering said processing fluid" (claim 13).

The Examiner admits: "Unlike claimed invention, Futase doesn't describe controlling or maintaining the temperature, 'T', of the suspension fluid at temperature different from the ambient temperature in order to affect the processing of an edge region of the top surface of the substrate."

The Examiner argues: "Ito describes a method for processing a substrate comprising processing the upper surface with a solution (col. 7, line 4-5) and supplying a fluid against the lower surface including the circumferential portion or edge of the substrate and controlling the T of the fluid by heating or cooling it (claimed maintaining it at T different from the ambient T) (col. 4, line 20-25; col. 7, line 20-34; col. 8, line 17-24, line 34-42; col. 10, line 39-47). It would have been obvious for one skill in the art at the time of the invention to modify Futase in light of Ito because Ito teaches that controlling the T by heating or cooling the T would provide uniform T profile of the substrate and improve the etching uniformity over entire of the surface (col. 3, line

45-col. 4, line 5)".

With respect to claims 1 and 13, Applicants respectfully contend that the Examiner's argument for modifying Futase by the teaching of Ito is not persuasive. Ito's technique of maintaining a spatial uniformity of etching through temperature control is characterized by a basic assumption (discussed *infra*) and by a methodology for selectively controlling the spatial distribution of heating or cooling along the upper surface of the substrate.

The basic assumption in Ito is that in the absence of the temperature control, the etching is spatially nonuniform due to a non-uniform temperature distribution along the upper surface of the substrate. Ito's invention addresses this problem by selectively heating or cooling specific spatial regions of the substrate.

As to said basic assumption, the Examiner has not cited any evidence showing that the etching performed in the Futase invention is spatially non-uniform. Indeed, Futase identifies only one etch rate for the entire substrate and does not anywhere teach or suggest that the etch rate varies spatially over the surface of the substrate. Thus, there is no indicated need in Futase for being modified by the teaching of Ito. To modify Futase by the teaching of Ito would unnecessarily add complexity and cost to the Futase invention.

The methodology in Ito for selectively controlling the spatial distribution of heating or cooling along the lower surface of the substrate is achieved by use of a cooling device 104 comprising flow of the second fluid in tubes. The tubes are configured to have a tube geometry that constrains the second fluid to be more concentrated in certain spatial regions than in other spatial regions. Ito discloses that control of the spatial distribution of heating or cooling along the

upper surface of the substrate is achieved by design of the spatial distribution of tube density, which controls the spatial distribution of the second fluid in relation to the lower surface of the substrate. See Ito, col. 10, lines 53-59 ("When it is desired to cool the central part of the wafer 202 especially well, for example, the tube T may be configured to be dense in the central part and scarce in the outer side. In contrast, when it is desired to cool the outer side of the wafer more powerfully than the central part, the tube T is configured to be dense in the outer side").

The point is that Ito's invention not only makes the second fluid hotter or cooler than the ambient temperature, but also selectively controls the spatial distribution of the second fluid in relation to the lower surface of the substrate.

In contrast, Futase has no available apparatus for selectively controlling the spatial distribution of the second fluid in relation to the lower surface of the substrate. FIG. 12 of Futase, and the description thereof, indicates that the second fluid is a nitrogen gas that originates from a gas feed unit 105. Based on the geometry in FIG. 12 of Futase, the nitrogen gas will be distributed uniformly along the lower surface of the substrate. What Futase is doing with the nitrogen gas is akin to filling a tire with air, wherein the air distributes itself uniformly within the available volume of the tire. There is no enablement in Futase for selectively imposing a spatially nonuniform distribution of the nitrogen gas along the lower surface of the substrate as is done in Ito. Modifying Futase with Ito's tube configuration will not work, because the hydrogen gas in Futase must be in direct mechanical contact with the lower surface of the substrate 1 in order to float the substrate 1 (see Futase, col. 14, lines 2-3: "the nitrogen gas is fed against the lower surface of the wafer 1 to permit the wafer to be floated"). Thus, Ito's teaching cannot be enabled in Futase. The Examiner has not even addressed the issue of how to modify Futase in light of Ito.

Based on the preceding arguments, Applicants respectfully maintain that claims 1 and 13 are not unpatentable over Futase in view of Ito, and that claims 1 and 13 are in condition for allowance. Since claims 2-12 and 21-23 depend from claim 1, Applicants contend that claims 2-12 and 21-23 are likewise in condition for allowance. Since claims 14-16 depend from claim 13, Applicants contend that claims 14-16 are likewise in condition for allowance.

In addition with respect to claim 15, Futase in view of Ito does not teach or suggest the feature: "sensing the temperature of said suspension fluid **proximate to said annular opening**" (emphasis added). The Examiner argues that "Ito suggests using a sensor to control the temperature of the fluid (col. 8, line 30-33, line 55-60)." In response, Applicants maintain that Ito, col. 8, line 30-33, line 55-60 does not disclose a temperature sensor and most certainly does not disclose locating a temperature sensor "proximate to said annular opening" as required by claim 15. In fact, the Examiner has not even addressed the issue of locating a temperature sensor "proximate to said annular opening" as required by claim 15. Thus, the Examiner has not established a *prima facie* case of obviousness with respect to claim 15.

Moreover with respect to claim 15, Futase in view of Ito does not teach or suggest the feature: "controlling the temperature of said suspension fluid proximate to said annular opening to a predetermined value". The Examiner argues that "Ito suggests using a sensor to control the temperature of the fluid (col. 8, line 30-33, line 55-60)." In response, Applicants maintain that Ito, col. 8, line 30-33, line 55-60 does not disclose the preceding feature of claim 15. Thus, the Examiner has not established a *prima facie* case of obviousness with respect to claim 15.

In addition with respect to claim 21, Futase in view of Ito does not teach or suggest the feature: "a temperature sensor that measures the temperature of the second fluid **near the edge of the substrate**" (emphasis added). The Examiner argues that "Ito suggests using a sensor to control the temperature of the fluid (col. 8, line 30-33, line 55-60)." In response, Applicants maintain that Ito, col. 8, line 30-33, line 55-60 does not disclose a temperature sensor and most certainly does not disclose locating a temperature sensor "near the edge of the substrate" as required by claim 21.

The Examiner argues that "it would have been obvious at the time of the invention for one skill in the art to use a T sensor in order to sense the T at the edge of the substrate to provide a uniform T profile of the substrate for etching with a reasonable expectation of success". In response, Applicants contend that the preceding argument by the Examiner is not persuasive because measuring the temperature at the edge of the substrate provides no information about the temperature at the center of the wafer and therefore cannot be indicative of a uniform temperature profile over the entire surface of the substrate. Moreover, the preceding argument for obviousness by the Examiner was created by the Examiner and is not found in the prior art. In other words, the Examiner has not supported the preceding argument by teachings in the prior art. Thus, the Examiner has not established a *prima facie* case of obviousness with respect to claim 21.

In addition with respect to claims 22-23, the Examiner has not provided any argument as to why claims 22-23 are allegedly unpatentable over Futase in view of Ito. Thus, the Examiner has not established a *prima facie* case of obviousness with respect to claims 22-23.

35 U.S.C. §103(a): Futase in View of Ito and JP 11-081

The Examiner rejected claims 22 and 23 under 35 U.S.C. §103(a) as allegedly being unpatentable over Futase and Ito as applied to claim 21 above, and further in view of JP 11-6081.

Since claims 22-23 depend from claims 1 and 21, which Applicants have argued *supra* to not be unpatentable under 35 U.S.C. §1023(a) over Futase in view of Ito, Applicants maintain that claims 22-23 are likewise not unpatentable under 35 U.S.C. §1023(a) over Futase in view of Ito and further in view of JP 11-6081.

In addition, the Examiner argues: "Ito describes using the cooler device and the heater (col. 8, line 24-40). Even though Ito is silent about using a controller for displaying the T and the controller being electrically connected to the T sensor and the thermal device to heat or cool the substrate, using T sensor, indicator (display the T), and the T controller to control T during the etching is well known to one skilled in the art as shown here by JP-11-6081 (please see the abstract). Therefore, it would be obvious to any skilled in the art that a display and a T controller must be used in connection to the T sensor in order to control the T at the peripheral and the center of the substrate being etched as taught by Ito."

In response, Applicants note that JP-11-6081 discloses a controller to control the temperature of the etching liquid which is not what is recited in claims 22-23. Rather, claims 22-23 recite use of a controller in conjunction with the temperature of the second fluid which is not the etching liquid. Therefore, the Examiner's argument is not persuasive.

In addition with respect to claims 22-23, Applicants respectfully maintain that the Examiner's argument with respect to JP-11-6081 is an improper modification of the secondary reference of Ito. The Examiner argues that the primary reference of Futase discloses most of the features of claims 22-23. The Examiner also argues that the secondary reference of Ito has modified the primary reference of Futase, by alleging that Ito teaches or suggests the temperature sensor. The Examiner additionally argues that the secondary reference of JP-11-6081 has modified the secondary reference of Ito, by alleging that JP-11-6081 teaches or suggests "a controller for displaying the temperature measured by the sensor". Applicants maintain that it is improper to argue that a claim feature is taught or suggested by a secondary reference through modification of another secondary reference. If the Examiner could modify a secondary reference in the preceding manner, then the Examiner would be able to show the existence of any element or feature of any claim merely by chaining a sufficient number of secondary references together in the preceding manner. Accordingly, Applicants respectfully maintain that the rejection of claims 22-23 under 35 U.S.C. §103(a) is improper and should be withdrawn.

CONCLUSION

Based on the preceding arguments, Applicants respectfully believe that all pending claims and the entire application meet the acceptance criteria for allowance and therefore request favorable action. If the Examiner believes that anything further would be helpful to place the application in better condition for allowance, Applicants invites the Examiner to contact Applicants' representative at the telephone number listed below. The Director is hereby authorized to charge and/or deposit Account 09-0456.

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